HOPE LINE RELOCATION STUDY

REPORT TO THE DENALI COMMISSION

Project 121-DC-2004-19

January 5, 2006

Prepared by:

Chugach Electric Association, Inc.

5601 Electron Drive / 99518

P.O. Box 196300

Anchorage, Alaska 99519-6300

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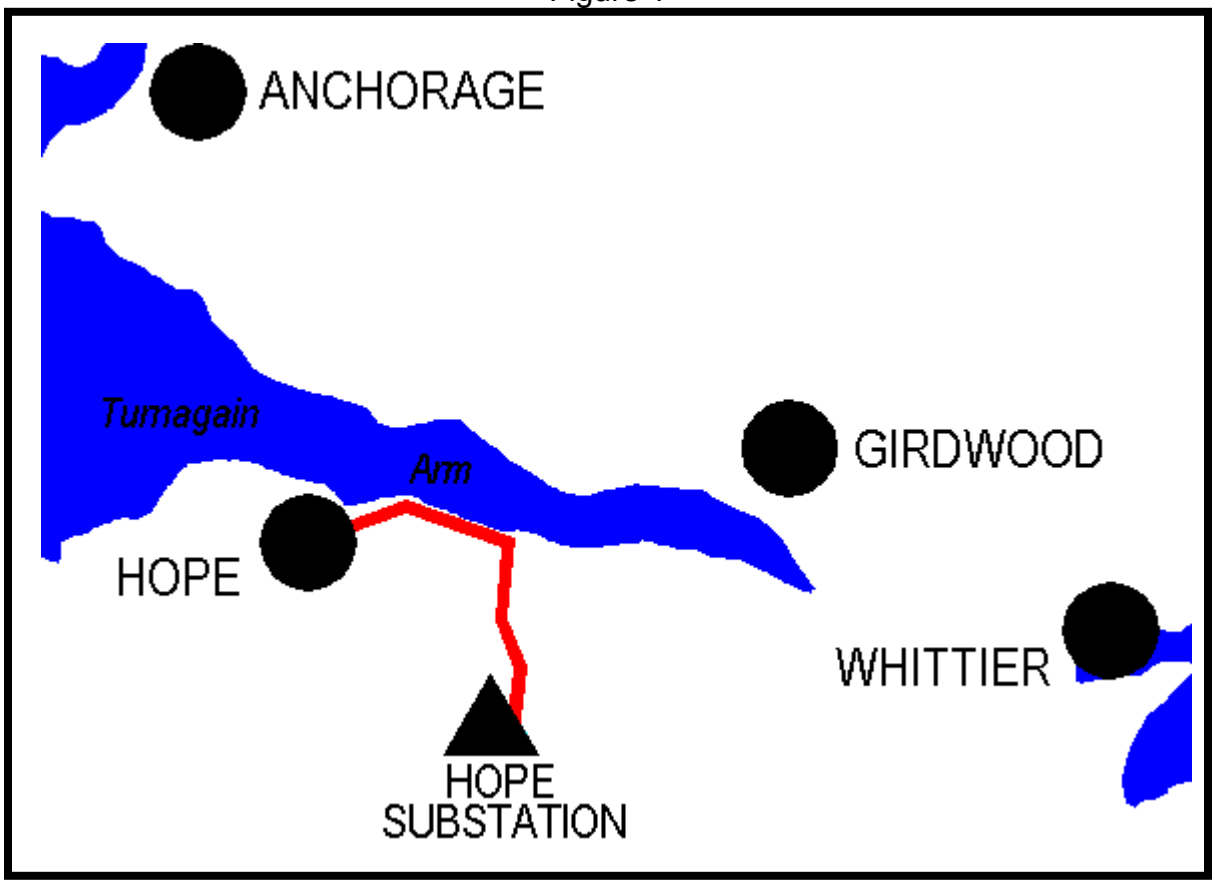
I. Executive Summary

The Chugach Electric Association, Inc., (Chugach) single-phase power distribution line serving the community of Hope, Alaska, and the surrounding area experiences frequent and lengthy power outages as a result of the terrain and climate the line encounters. The line originates at Chugach's Hope Substation, located near the Hope Highway Cutoff at Seward Highway milepost 56, and runs approximately 17.7 miles through Chugach National Forest and Department of Natural Resource (DNR) Land to the community of Hope. The line currently serves approximately 200 metered locations.

Figure 1



Map of Study Area

Since the line was installed in 1967, it has experienced many outages due to harsh weather, avalanches, and large tree contacts (most recently associated with the spruce bark beetle infestation.)

Over the years the attempts to address line outage problems have been only partially successful. Additional poles were installed and other structures were rebuilt in an effort to increase reliability. Troubleshooting was improved somewhat in 1995 when devices known as fault indicators were installed on the line.

In 2004, Chugach obtained financial assistance from the Denali Commission to conduct a comprehensive investigation of the causes of line outages and recommend certain programs or projects that could serve to reasonably mitigate many of the problems.

Following analysis of historical outage data, interviews with Chugach personnel, interviews with outside agency personnel and end-to-end field investigations, a series of recommendations have been developed. These recommendations take into account the following:

1. Improved access to the right-of-way from the Seward and Hope Highways
2. Right-of-way vegetation control and clearing
3. Avalanche damage avoidance
4. Modifications and strengthening of the line to mitigate weather impacts

Specific types of mitigation recommendations include:

1. Relocating portions of the line to improve access
2. Raising and relocating the line through avalanche paths
3. Undergrounding the line through avalanche paths
4. Widening the cleared right-of-way to 80 feet in certain locations
5. Removing danger trees associated with spruce bark beetle kill
6. Improving several existing access routes
7. Establishing additional new access routes
8. Inserting taller poles for greater clearance or to shorten span lengths
9. Changing out dead-end insulator strings

It is recommended that the mitigation effort be divided into separate line sections and take place over a period of four years with initial efforts focused on the Hope Substation to Hope Highway milepost 1.7. The recommendations identified by location are outlined in Section VI: Recommendations.

Chugach has developed preliminary cost estimates for each of the individual mitigations. The total cost of the proposed mitigations is estimated to be $3,714,000, in 2005 dollars, excluding engineering and overhead.

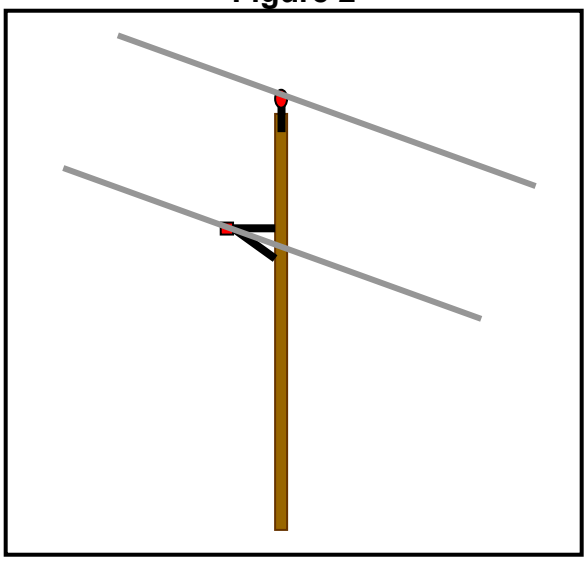
II. Background

The 14.4 kV distribution line and Hope Substation that serves the community of Hope, Alaska, was constructed between 1967 and 1968. The line originates at Chugach's Hope Substation located approximately one mile south of the Hope Cutoff on the Seward Highway. The line runs approximately 17.7 miles northwest to the community of Hope. It is primarily located upslope of the Hope Highway, traversing much of its length through heavily wooded spruce, alder and birch forest. Subsequent to the distribution line installation, a major tap line was constructed at Silvertip to provide power to State of Alaska and Chugach microwave telecommunication facilities. Because of the Silvertip tap, a portion of the line must traverse adverse terrain regardless of any relocation alternatives.

Due to its location along coastal mountains, the line is subject to harsh conditions associated with high winds, heavy wet snow and avalanches. These conditions are brought about in great part due to the line location occurring between the Prince William Sound weather system and the South Central Alaska weather system. In addition, the line has been increasingly impacted as a result of the spruce bark beetle infestation on the Kenai Peninsula.

The line was constructed with wood pole structures employing a vertical framing configuration. Vertical framing involves a single pin type insulator mounted on the top of the pole and a second insulator mounted on a standoff bracket at a location down from the pole top insulator.

Figure 2



Vertical Framing

When snow and ice accumulate (loading) on a distribution line, the unloading of the bottom conductor prior to unloading of the top conductor can present momentary or long-term contacts between the conductors. The contact results in short circuits and

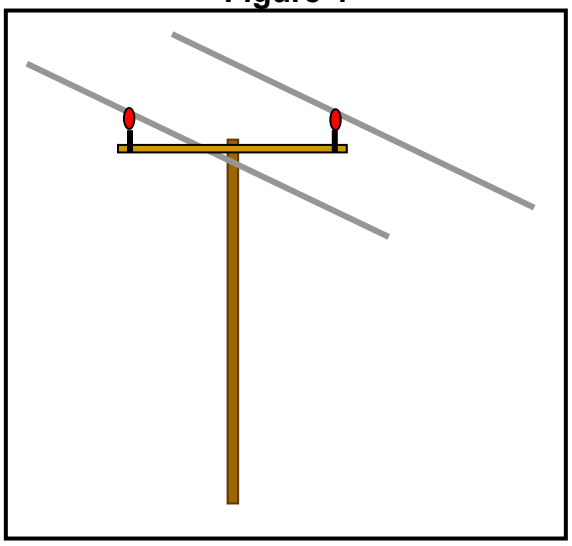
subsequent fuse or recloser operations and de-energization of part or all of the line. Additionally, heavy ice and snow loading can cause failures of the standoff brackets or the structures themselves. The photograph below illustrates the effects of snow and ice loading.

Figure 3

Snow and ice loading

In an attempt to mitigate the loading problems associated with the vertical construction, portions of the line have been reconstructed over the years employing a cross arm configuration.

Figure 4



Cross Arm Framing

This solution proved to have a very limited benefit. Ice and snow loading, as well as heavy winds continued to result in ground level conductor sag or in knocking the conductor down. In more recent years, the onset of the spruce bark beetle infestation on the Kenai Peninsula has resulted in a rapidly accelerating tree kill in the area. As the trees die, they tend to dry out very quickly and become brittle; consequently, trees that could once survive 100 miles per hour winds are now falling at wind speeds in the 60 to 80 miles per hour range.

As a result of the unique terrain and climate conditions the line is exposed to, the community of Hope incurs power outages at a frequency much higher than the Chugach overall system. In addition, the outage durations are much longer due to the terrain and accessibility as well as repair work limitations while heavy winds, heavy snow or avalanche conditions persist. It is very common for the repair crews to have to wait for weather/work conditions to improve before they can reach structures that are located well off the road system. From 1999 through 2004, residences in Hope have been without power an average of twenty-four times longer than other Chugach members.

Over the years, attempts to address line outage problems have been only partially successful. From 1985 to 1998 several projects were constructed installing approximately 60 insert poles, reframing approximately 90 poles and replacing approximately two miles of damaged line. Troubleshooting was improved somewhat in 1995 when devices known as fault indicators were installed. Fault indicators are visual indicators placed on the wire. They assist in troubleshooting by giving field response crews an indication of how far down the line a short circuit has occurred.

In early 2004, Chugach secured funding assistance from the Denali Commission for the expressed purpose of reviewing the conditions that contribute to the higher than average length of outages on the Hope distribution line. The funding assistance also

has provided the opportunity to develop of a series of recommendations on types of mitigations that should be employed to reduce the frequency and duration of these outages.

Chugach's staff conducted analysis of historical outage data, interviewed Chugach Operations and Maintenance (O&M) field personnel, interviewed state and federal agency personnel and conducted extensive end-to-end field investigations. Analysis of outage data was used to determine the most frequent causes of outages as well as those locations where outages occur most often. This analysis helped to set priorities on which location(s) to pursue possible mitigations. Interviews with O&M field personnel were used to determine what mitigation efforts were not successful in the past and what may be practical solutions for the future. Creating new access points, improving existing access points and improving access along the existing power line corridor are key components to future mitigation efforts. Study efforts commenced in February of 2004. Appendix A contains additional illustrative photographs of problems encountered.

III. Study Objective

Chugach's application to the Denali Commission was based on a feasibility study whose objectives were intended to accomplish the following:

1. Identify specific locations for relocation of the 14.4 kV line based on line segments known for wind and avalanche problems
2. Select relocation method(s) - combining of overhead and underground
3. Determine required easements and permits from private individuals and governmental agencies
4. Develop estimated costs
5. Develop projected schedule
6. Preparation of written report

To accomplish the stated objectives it was necessary for Chugach to break the study effort into the following components:

1. Investigation of outage causes through the analysis of historical outage data (computerized)
2. Interviews with field personnel to confirm common outage causes and determine, from crew personnel perspective, what solutions are realistic and physically possible
3. Interviews with outside agency personnel to secure input on alternative route and/or access opportunities
4. End-to-end field investigations in both summer and winter conditions
5. Evaluation of alternatives
6. Selection of proposed projects
7. Development of preliminary cost estimates

Using the criteria and objectives above, a series of detailed mitigation projects for specifically identified segments of the line were developed.

IV. Investigations

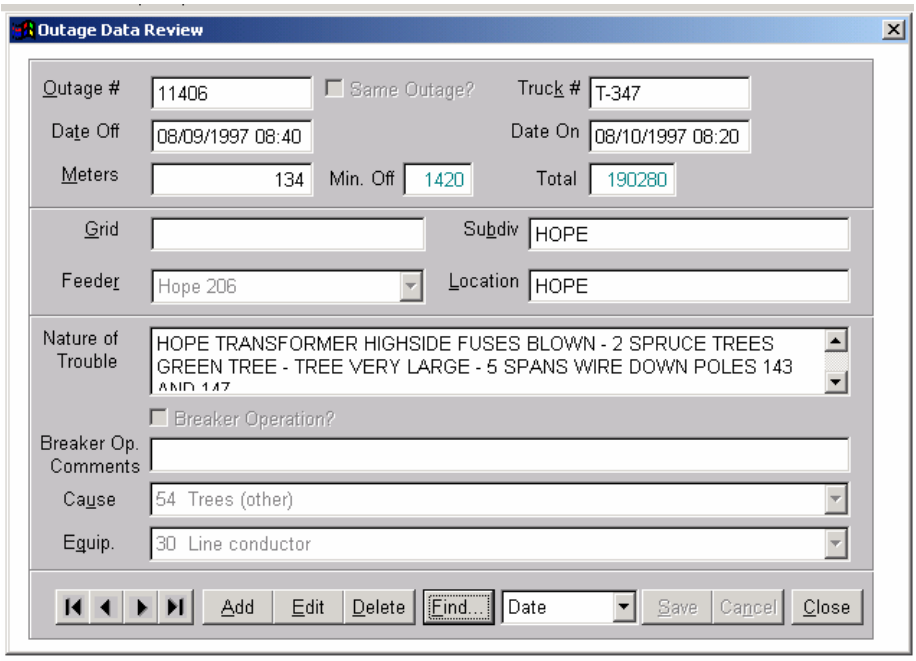
Investigations were broken into the following categories:

1. Analysis of historical outage data
2. Interviews
3. Summer and winter field visits

Except for momentary outages, Chugach records and classifies data on all outage activity. This data is computerized to provide reports to O&M personnel, engineers, financial and other institutions and the Regulatory Commission of Alaska. Reports are generated monthly and annually with focus on specific substation feeders and outage cause types. Users are able to review the types of outages, frequencies, trending and calculate certain indices used in the industry to measure feeder, substation and overall system performance.

A sample outage data record is shown below:

Figure 5



Example-Single Outage Database Record

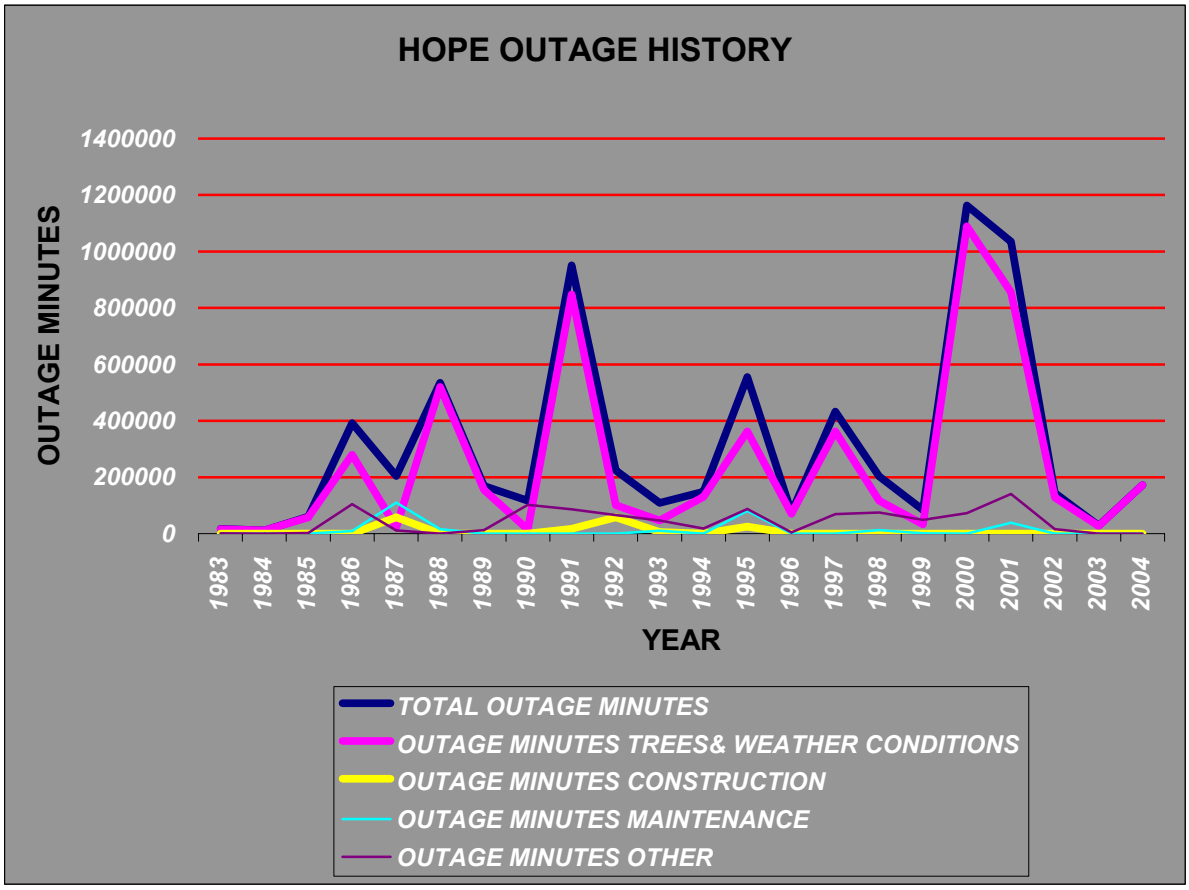
In the case of the Hope circuit, outage history data dating from 1983 was accumulated to assist in the analysis. Outage history data earlier than 1983 was not readily available since events prior to that date were not captured in a computerized database. It was determined that 20 years of data would be a sufficient base to establish trends and types of outages affecting the line.

The analysis of outage history for the Hope circuit determined that outages were caused most frequently by the following factors in order of their occurrence:

1. Tree contact with the line due to wind, snow or tree failure caused by beetle kill
2. Line conductor contact (excess sag) with the ground due to snow or ice loading
3. Structure (pole), hardware or equipment failure related to wind or snow

The following graph illustrates the outage impacts when focusing on weather and vegetation related causes:

Figure 6



Major Outage Contributors

The line is subject to a cycle-based vegetation control (clearing) program. In most instances, the existing right-of-way width is 40 feet, however, clearing does not always extend to the full width of the right-of-way. Clearing widths depend on several factors including terrain and projected benefit of effort. The trees are substantially taller than the power line in many locations, consequentially left-to-right clearing beyond the existing right of way is not going to protect the line from trees brought down by wind, ice or snow. In many areas clearing both within the right-of-way and outside the stated right of way is warranted.

Interviews with Chugach O&M field crews confirmed the findings of the computer data analysis. The crews provided first hand information into the underlying causes of outages attributed to wind, snow, avalanche and spruce bark beetle. In addition, the crew interviews were very helpful in understanding what structure types were most effective. The crews confirmed that improved access, additional clearing and relocating portions of the line closer to the two highways were key to reducing outage times. Summarized information from the interviews with the O&M crew is provided in Appendix B.

Interviews with outside agencies provided input on opportunity or lack of opportunity to relocate the line closer to the Seward and Hope Highways. Interviews with the Alaska Department of Transportation and Public Facilities (DOT/PF) focused on placing new poles or a new underground line in the road right-of-way adjacent to the road prism or under the shoulder. This concept was not well received due to DOT/PF concerns about new electrical facilities compromising the road prism. In addition, portions of the road right-of-way are actually under easement from the United States Forest Service (USFS) and DOT/PF would have certain restrictions on granting other uses of the right-of-way.

There is a potential joint opportunity for Chugach, USFS and DOT/PF relative to the development of forest fire breaks associated with high risk fire areas linked to the spruce bark beetle tree kill problem. Unfortunately agency priority and funding may preclude this opportunity to any serious degree in the near future. Compiled information from the agency interviews are provided in Appendix D.

Field investigations were conducted along the entire power line route including the Silvertip Tap. Chugach personnel made seasonal visits to the right-of-way and power line to observe them in various field conditions. Seasonal visits gave Chugach the opportunity to observe the extent of snow cover and related access issues as well as to observe the vegetation when trees were in full foliage. The field visits were vital in determining specific mitigation projects and permitted the opportunity to validate the feasibility of improvements proposed by O&M personnel.

See Appendix A for representative photos of the right-of-way, the structures and other electrical facilities located in the right-of-way.

V. Mitigation Alternatives

Chugach considered the following alternatives prior to proposing the series of recommendations that follow:

1. Rebuilding the line overhead at its current location using high strength materials
2. Undergrounding the line in its present location
3. Relocating the entire line adjacent to the Seward and Hope Highway rights-of-way either overhead or underground
4. Relocating the entire line into the Seward and Hope Highway road corridor either overhead or underground
5. Utilizing a new type of conductor
6. Expanding the cleared right-of-way width (clearing the line from the reach of the tallest trees)
7. Maintain the status quo

Options one, two, three and five have been included in the final recommendations. Option four was discounted based on input from the outside agencies due to cost and constructability factors. Option six was prohibitive due to the high cost to initially perform and to maintain. Option seven was discounted based on the compelling need to improve line reliability and to reduce costs associated with unscheduled power outages and the related emergency response.

Evaluating input from in-house and outside agency personnel and examining the onsite field investigation data allowed Chugach to systematically eliminate many of the above options. It was then determined that the best course of action was to develop a series of smaller project mitigations that could be accomplished over a period of time.

Chugach separated the project mitigation recommendations into four major geographical sections and each section was then further divided into a series of smaller subproject portions.

A cost estimate based on the four major line sections has been prepared as well as maps to correlate the proposed work locations. Appendix D provides a series of maps that correlate the proposed mitigations to their geographical locations. Cost estimates for the proposed mitigations are contained in Appendix E.

VI. Recommendations

This report makes two overall recommendations:

1. Mitigations to improve service to the Hope area should be broken into four distinct projects and completed based on the schedule (contingent upon funding sources and availability) in Appendix F
2. Grant funding for the first phase of the mitigations should be sought in a cost-sharing basis

The following mitigations are recommended:

SECTION 1

Hope Substation to Hope Highway Milepost 1.7: Pole 1 to Pole 31 and Silvertip Tap

- Clear right-of-way to a width of 40'
- Remove danger trees outside the right-of-way
- Install nine insert poles and three double dead-end framing insert poles
- Re-conductor from pole 12 to pole 12R12 (approximate length: one mile)
- Improve access from Seward Highway milepost 55.5 to pole 6 and from the Hope Highway, milepost 0.3 to pole 12R7
- Complete and improve access along right-of-way from pole 6 to pole 12R4
- Clear right-of-way for new overhead line adjacent to Hope Highway from milepost 0.3 to milepost 1.7, an approximate 30'-40' width, and remove danger trees
- Install 24 poles and 1.4 miles of new conductor
- Remove existing power line from pole 12 to pole 31, approximately 2.1 miles

SECTION 2

Hope Highway Milepost 1.7 to Milepost 5.5: Pole 32 to Pole 68

- Clear right-of-way for new overhead line adjacent to Hope Highway from pole 31 to pole 69, an approximate 30'-40' width, and remove danger trees
- Install 60 poles and four miles of new conductor
- Remove existing power line from pole 31 to pole 69, approximately 3.8 miles

SECTION 3

Hope Highway Milepost 5.5 to Milepost 10: Pole 69 to Pole 120

- Install seven insert poles and four double dead-end poles
- Clear right-of-way to a width of 40' and remove danger trees
- Poles 85 to 100: Right-of-way width is restricted due to private property; remove danger trees only
- Improve access roads at mileposts 5.6, 6.1, 6.45, 7.2, 8.25, 9.0, 9.8 and 10.15 Remove trees and re-grade access routes
- Change out dead-end insulator strings on approximately ten structures
- Re-grade access paths in right-of-way to improve equipment mobility along line

SECTION 4

Hope Highway Milepost 10 to Town of Hope: Pole 121 to Pole 208

- Avalanche zones
  - Poles 139 – 142: Install taller poles and 4/0 ACSR for long span over avalanche valley
  - Poles 155 – 158 (1200'): Install line underground
  - Poles 162 – 163 (400'): Install line underground
- Clear right-of-way to width of 40'
- Remove danger trees along entire section
- Pole 175 – 208: Right-of-way width is restricted due to private property; remove danger trees only.
- Install four insert poles and two double dead-end framing insert poles
- Poles 148 – 149: Install 4/0 ACSR and dead-end structures to span climbing bluff
- Improve access points at mileposts 10.33, 10.45, 10.74, 11.2, 11.5, 11.98, 12.32, 12.55, 13.1, 13.3, 14.6 14.85, and 15.1
- Re-grade access path in right-of-way to improve equipment mobility
- Change out dead-end insulator strings on approximately 14 structures

Grant funding for Section 1 should be sought as follows:

Year 2006 supplemental Grant amount requested:	$500,000
Apply funds remaining from original grant: (Project No. 121-DC-2004-19)	$ 40,000
Proposed Chugach contribution (minimum):	$ 60,000
Section 1 Estimated Project Total:	**$600,000**

APPENDICES

Appendix A: Photos

Appendix B: Operation and Maintenance Personnel Interviews

Appendix C: Agency Interviews

Appendix D: Maps

Appendix E: Cost Estimates

Appendix F: Project Schedule

Appendix A: Photos

Figure 7

Tall Vegetation Adjacent to Cleared Right-of-Way

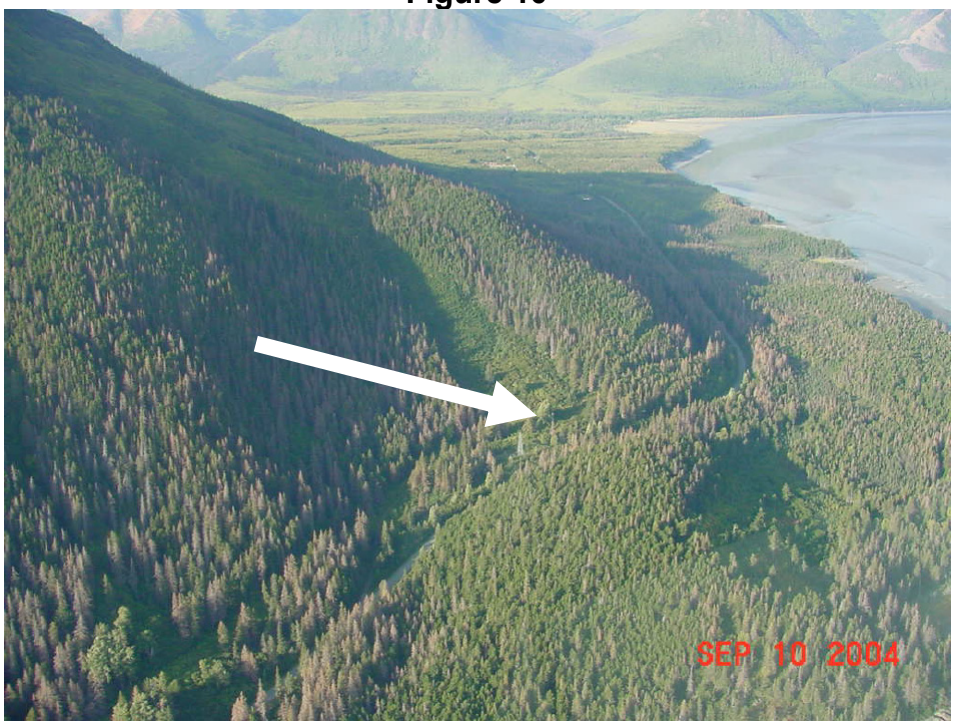
Figure 8

Overall Beetle Kill Problem

Figure 9

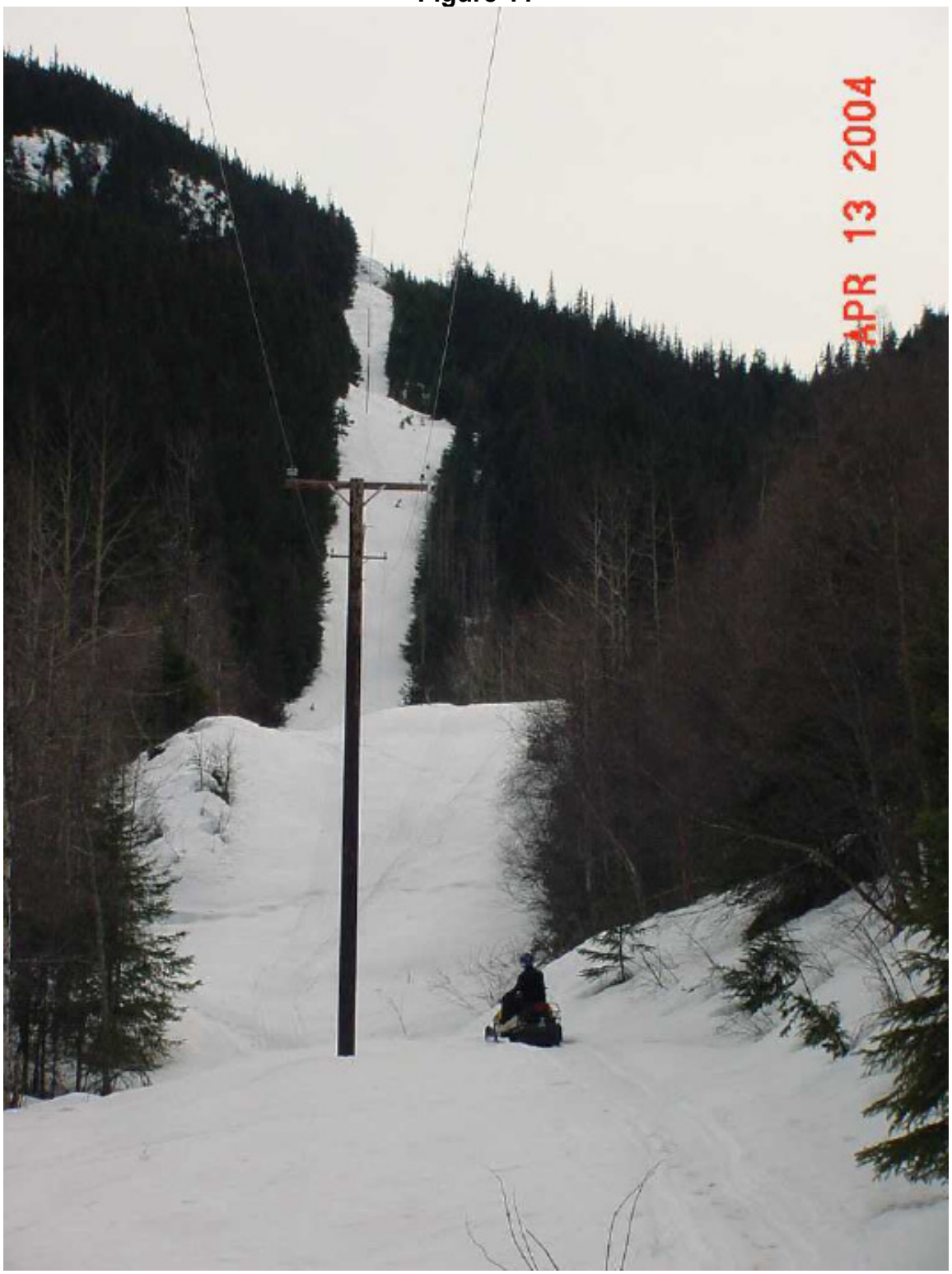
Beetle Kill Adjacent to Cleared Right-of-Way

Figure 10



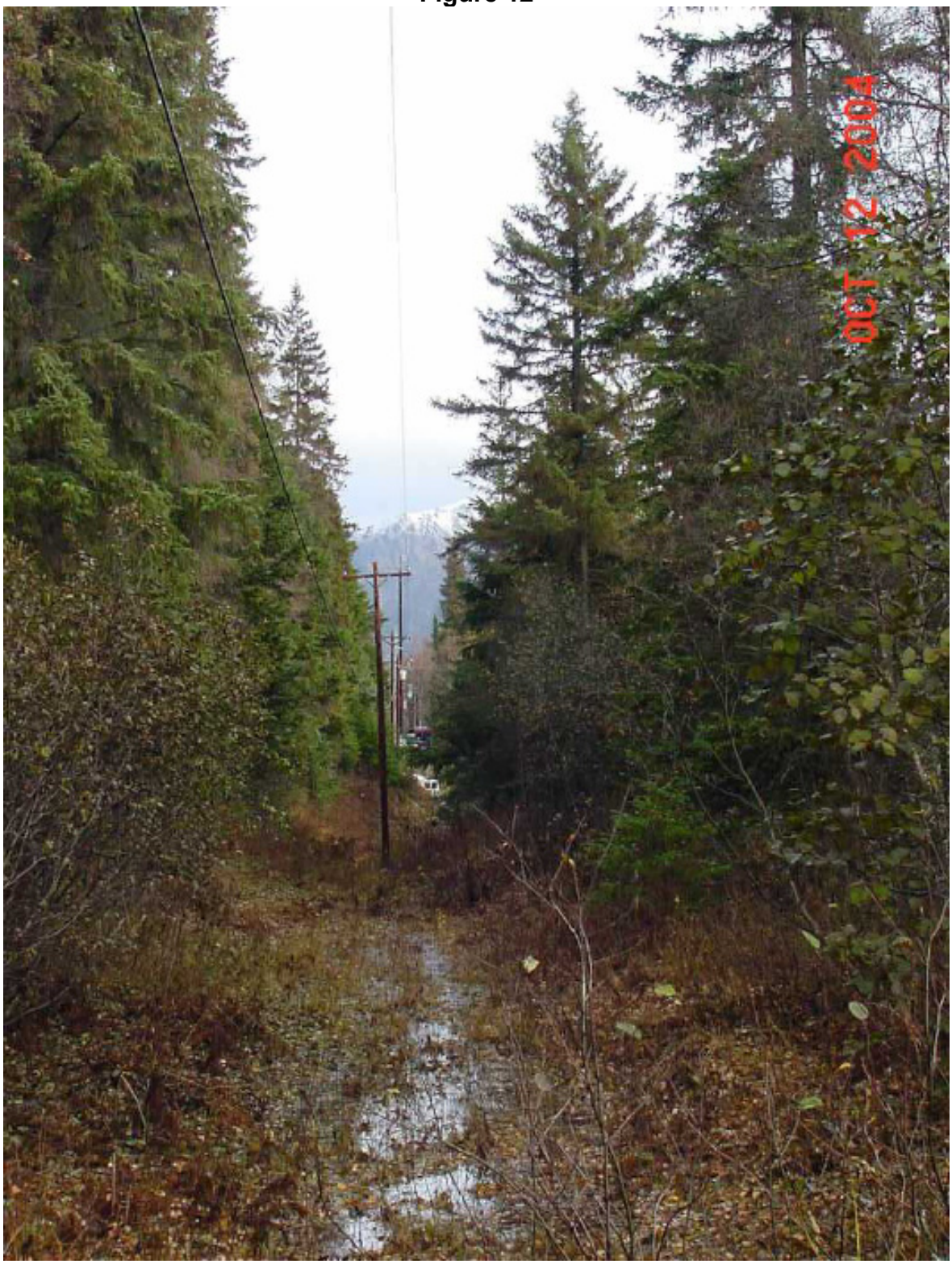
Avalanche Path Crossing Line Right-of-Way

Figure 11



Location with Severe Winter Terrain

Figure 12



Location Where Clearing Limitations Are Inadequate

Appendix B: Chugach Operation and Maintenance Personnel Interviews

Interviews were conducted with field personnel and then transcribed. The following is a brief summary of the interviews conducted:

ATTENDEES:
April 20, 2004
Mike Arnold, Senior Designer
Mike Gephart, Foreman Journeyman Lineman (retired 2004)
Morris Morgan, Journeyman Lineman (retired 2004)
September 30, 2004
Mike Arnold, Senior Designer
Dave Rebischke, Foreman, Journeyman Lineman
Max Dolchok, Journeyman Lineman
Frank Gwartney, Foreman, System Inspection

The following questions were asked of both groups:

- What areas had the highest number of outages?

  Multiple sections but no specific section was identified as having a higher number of outages. Outages have occurred throughout the line.

- What were the causes of the outages and what damage occurred?

  Major causes included snow and ice loading, beetle killed trees falling on/impacting lines and poles, long spans, high winds and avalanche chutes. Damage was identified as broken cross arms and wire, burned up wire, broken insulators and broken poles.

- What factors affected timely line repair?

  The factors that interfered with timely repair included equipment access, access areas not clearly marked, bog holes, rugged terrain and steep hills. To access the Silver Tip tap, an area that experiences frequent outages, approximately 1.5 miles of the line must be covered by snowshoe in winter.

- What comments/recommendations can be offered to resolve/minimize outages and outage durations?

  Recommendations include clearing of beetle-killed and other trees, relocating line underground near the road and improving access to the line.

It is noted that Mr. Gephart and Mr. Morgan worked the Kenai Peninsula portion of the system almost exclusively, having combined experience in the region in excess of 30 years.

Appendix C: Agency Interviews

United States Forest Service Interview

An interview was conducted with USFS personnel and then transcribed. The following is a brief summary of the interview conducted:

Date: September 28, 2004
Time: 1:00 p.m.
Location: CEA Accounting Conference Room

ATTENDEES:

Gary Meadows	CEA
Jim Topolski	CEA
Mike Arnold	CEA
Andy Schmitt	USFS
Karen O'Leary	USFS / via phone
Deb Cooper	USFS / via phone
Kathryn Linn	CEA

Chugach explained that the Hope Line Relocation feasibility study was intended to investigate potential mitigations for the extended outages experienced by the residents of Hope such as relocating the line, conducting more extensive clearing and rebuilding the line. Relocating it would probably mean moving it closer to the road either overhead or underground.

The U. S. Forest Service (USFS) was then asked what its thoughts were about the existing power line and its present location and what does it have planned along the route?

The USFS is concerned with clearing out hazardous vegetation fuels near communities to reduce the risk of wildfire. They are planning on clearing 600 ft. on either side of the highway (slope permitting). If the power line were within that area (600 ft.) they would like to coordinate the clearing with Chugach. As for relocating the line either along the road or elsewhere aesthetics and visuals are a concern. With regard to undergrounding the line, the USFS stated that archeological concerns would need to be addressed. Biological issues with regard to wildlife were mentioned as a possible concern with relocation. The fuels issue is of high importance to the USFS and increased clearing may have easier acceptance. The USFS recommends an exchange of maps identifying the areas most critical to Chugach for review. The USFS had no other comment or recommendations. They noted their role is to respond to plans or changes initiated by permit seekers.

Alaska Department of Transportation and Public Facilities Interview

An interview was conducted with DOT/PF personnel and then transcribed. The following is a brief summary of the interview conducted:

Date: September 29, 2004
Time: 1:00 p.m.
Location: DOT/PF Conference Room

ATTENDEES:

Gary Meadows	CEA
Jim Topolski	CEA
Mike Arnold,	CEA
Bill Strickler	DOT/PF
Rory Reddick	DOT/PF
Ken Morton	DOT/PF

Chugach explained that the Hope Line Relocation feasibility study was intended to investigate potential mitigations for the extended outages experienced by the residents of Hope such as relocating the line, conducting more extensive clearing and rebuilding the line. Relocating it would probably mean moving it closer to the road either overhead or underground.

DOT/PF was then asked what its thoughts were about the existing power line and its present location and what does DOT/PF have planned along the route?

DOT/PF indicated it has no issues with the present location of the line and will cooperate if the study indicates that relocation was necessary. The only work currently planned is a pavement overlay of the road. DOT/PF does not presently want the line relocated along the road next to the Seward Highway. Furthermore, unless no other options are available along the Hope Highway, DOT/PF expressed a desire not to have the line in the road right-of-way. As to the portion of the line that runs along the Seward Highway undergrounding from the Hope Substation to the Hope turnoff would be acceptable by running the line either below the slope or across the road on top of the embankment. DOT/PF feels undergrounding on the road shoulder is not an option because of the slope. Relocating the line overhead along the road may cause problems, not with DOT/PF but with others (unnamed) because of the “Scenic Byway” designation.

Department of Natural Resources Interview

An interview was conducted with DNR personnel and then transcribed. The following is a brief summary of the interview conducted:

Date: Tuesday, September 27, 2005
Time: 2:00 PM
Location: Department of Natural Resources

ATTENDEES:

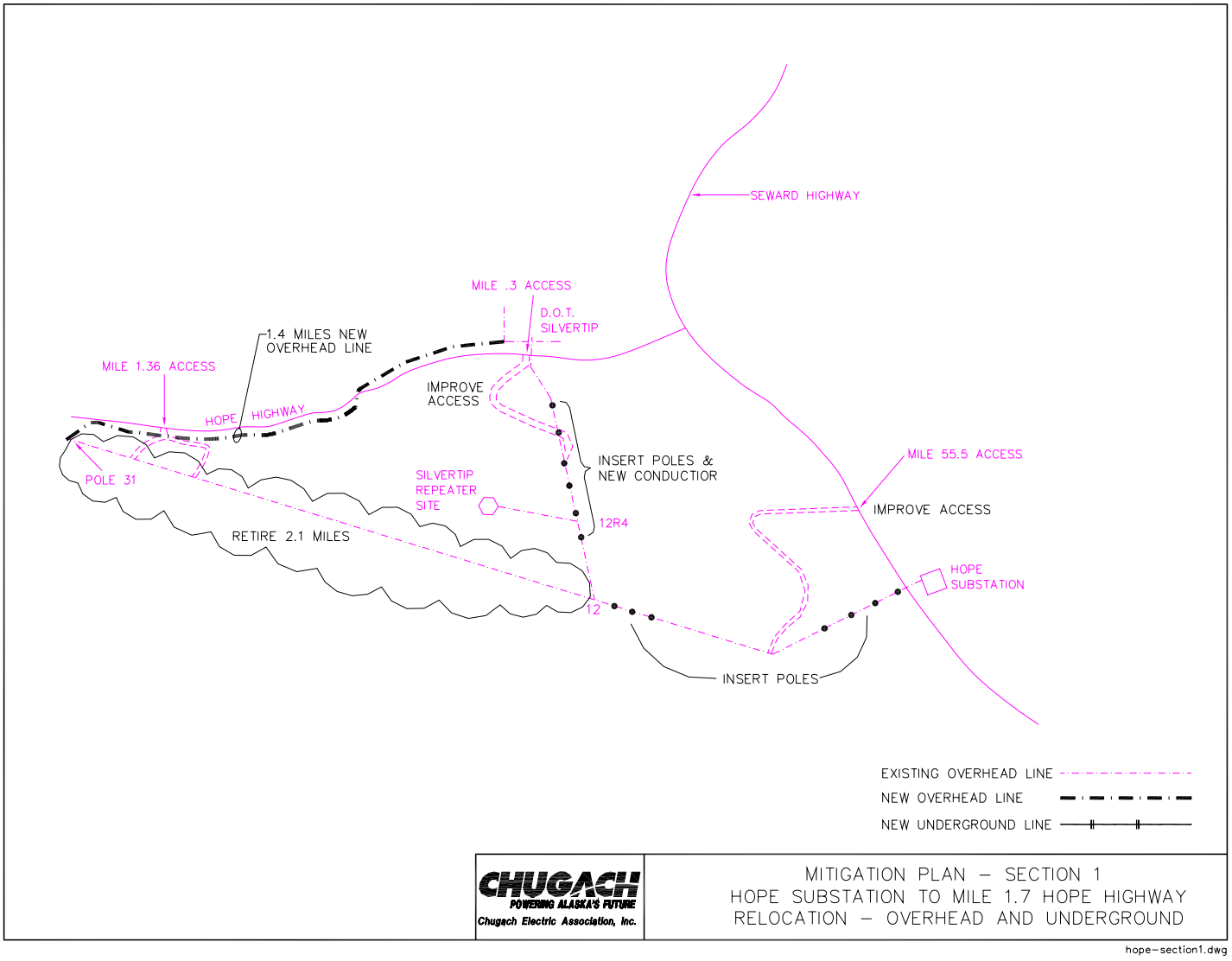
Marcie Menefee	DNR
Chelsie Kochanowski	DNR
Gary Meadows	CEA
Bill Bernier	CEA
Mike Arnold	CEA
Jim Topolski	CEA

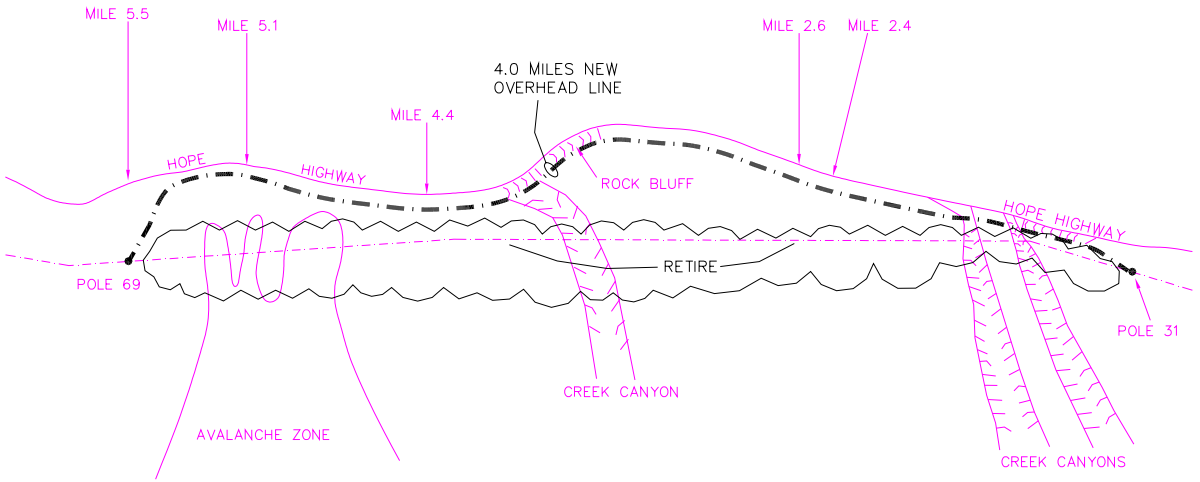
Chugach met with the DNR personnel and discussed the project at length to determine what DNR would require from Chugach to proceed with the project. Chugach also wanted to learn whether there were concerns from DNR regarding the project. DNR personnel stated that this property had only been recently transferred to them from the Forest Service and that Chugach was presently working with them on permitting access points as well as the line in its present location. The Mitigation Plan for Section One of the project was discussed and the DNR staff in attendance at the meeting saw no immediate or obvious barriers to proceeding with the plan. However, DNR stated that it would have to be reviewed by other agencies and permit holders in the area. Furthermore, DNR personnel stated that the permit process could take up to six months due to internal departmental review and the required statutory public notice period and that it would be best once Chugach had plans that they request a permit at that time. The plan would have to indicate all access roads that would be utilized along with any plans to improve or add access roads.

DNR offered to meet again with Chugach once the plans were finalized.

Appendix D: Maps

The following maps are intended to correlate the proposed mitigations discussed in Section V with the geographical locations in the field:


SEWARD HIGHWAY
MILE .3 ACCESS
D.O.T.
SILVERTIP
1.4 MILES NEW
OVERHEAD LINE
MILE 1.36 ACCESS
IMPROVE
ACCESS
HOPE
HIGHWAY
INSERT POLES &
NEW CONDUCTIOR
MILE 55.5 ACCESS
POLE 31
SILVERTIP
REPEATER
SITE
IMPROVE ACCESS
12R4
RETIRE 2.1 MILES
HOPE
SUBSTATION
12
INSERT POLES
EXISTING OVERHEAD LINE
NEW OVERHEAD LINE
NEW UNDERGROUND LINE
CHUGACH
POWERING ALASKA'S FUTURE
Chugach Electric Association, Inc.
MITIGATION PLAN – SECTION 1
HOPE SUBSTATION TO MILE 1.7 HOPE HIGHWAY
RELOCATION – OVERHEAD AND UNDERGROUND
hope-section1.dwg



EXISTING OVERHEAD LINE

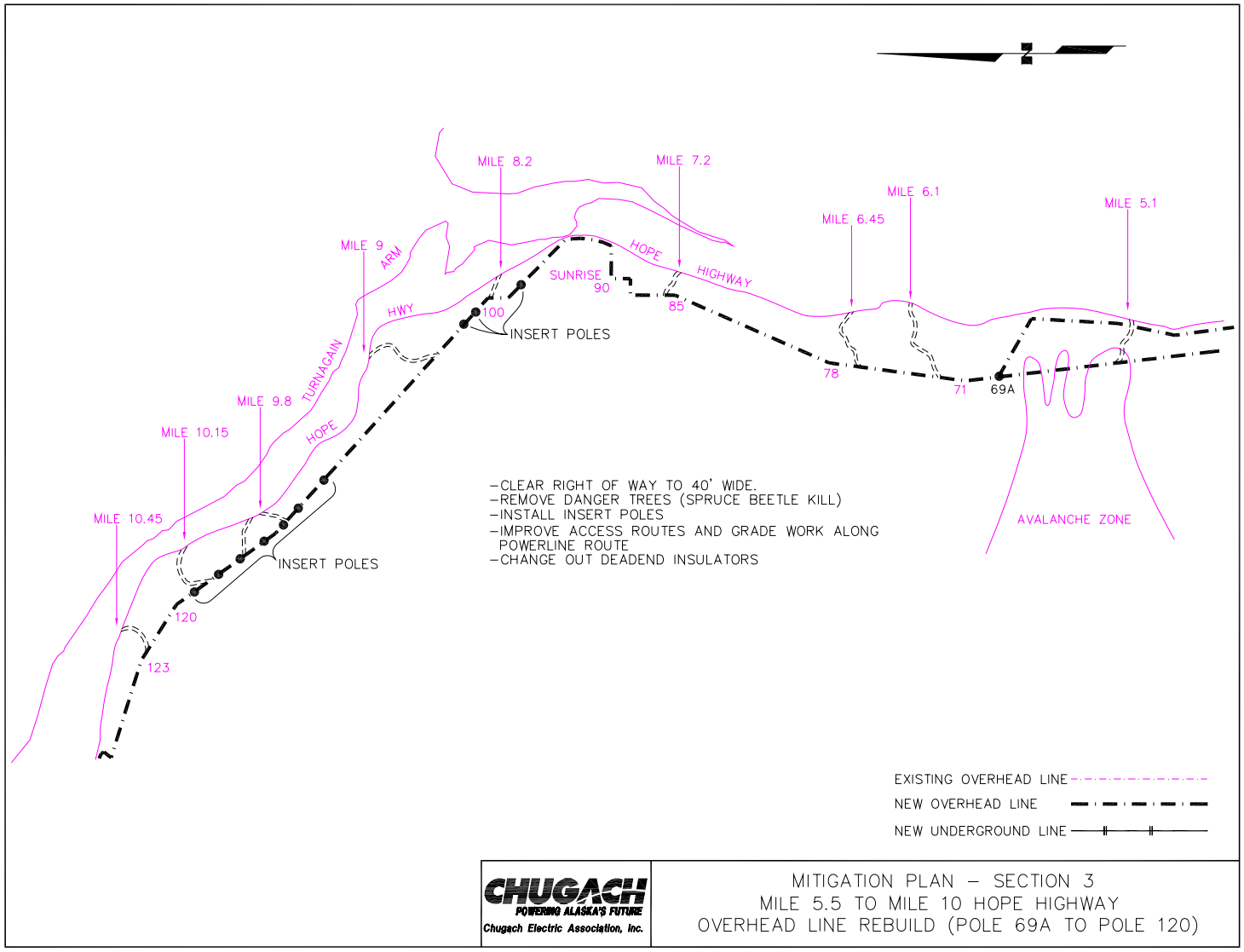
NEW OVERHEAD LINE

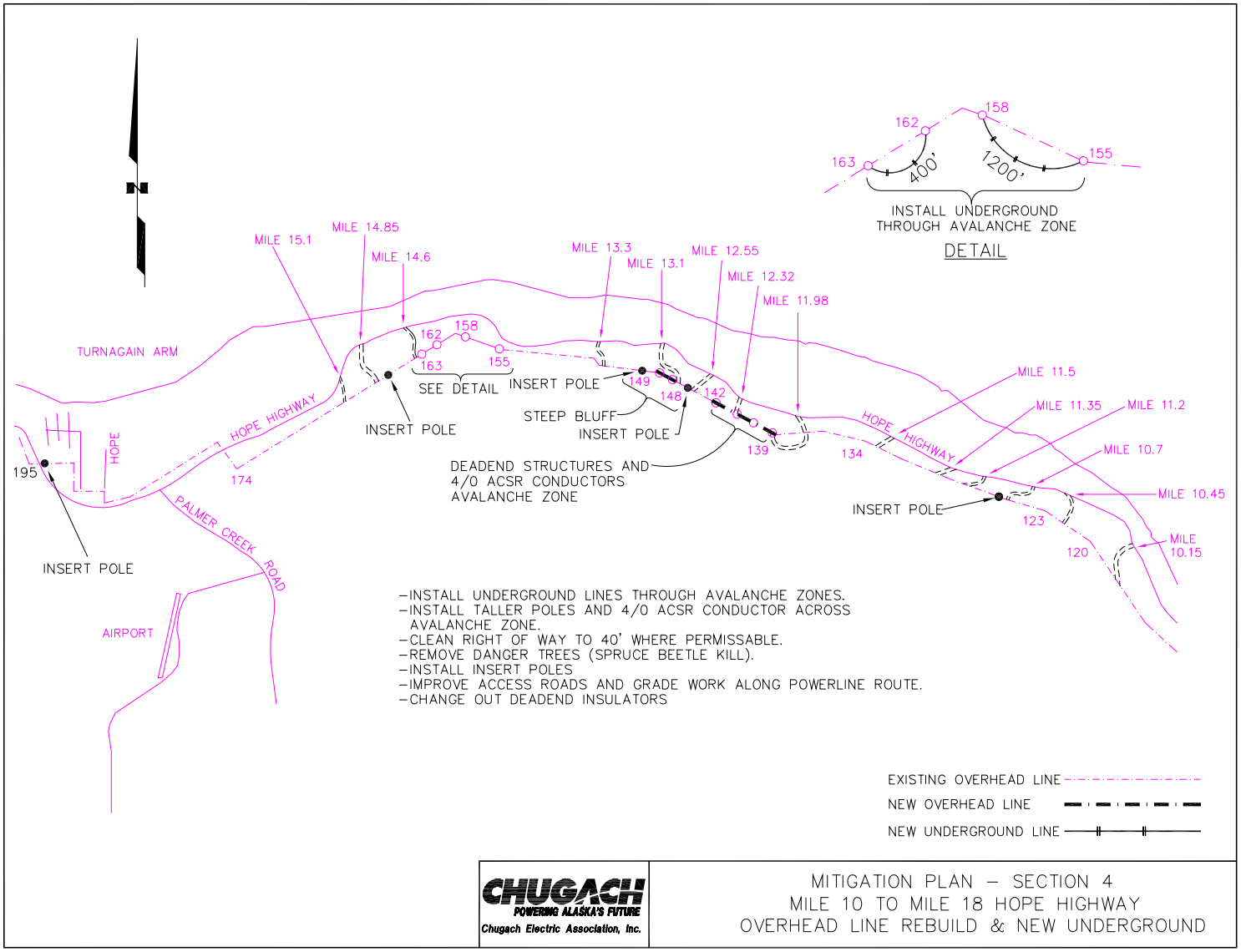
NEW UNDERGROUND LINE

CHUGACH
POWERING ALASKA'S FUTURE
Chugach Electric Association, Inc.

MITIGATION PLAN – SECTION 2
MILE 1.7 TO MILE 5.5 HOPE HIGHWAY
RELOCATION OF OVERHEAD LINE

hope-section2.dwg


MILE 8.2
MILE 7.2
MILE 6.1
MILE 6.45
MILE 5.1
MILE 9
ARM
HOPE
HIGHWAY
SUNRISE
90
85
HWY
100
INSERT POLES
TURNAGAIN
MILE 9.8
HOPE
MILE 10.15
78
71
69A
AVALANCHE ZONE
MILE 10.45
INSERT POLES
120
123
-CLEAR RIGHT OF WAY TO 40' WIDE.
-REMOVE DANGER TREES (SPRUCE BEETLE KILL)
-INSTALL INSERT POLES
-IMPROVE ACCESS ROUTES AND GRADE WORK ALONG POWERLINE ROUTE
-CHANGE OUT DEADEND INSULATORS
EXISTING OVERHEAD LINE
NEW OVERHEAD LINE
NEW UNDERGROUND LINE
CHUGACH
POWERING ALASKA'S FUTURE
Chugach Electric Association, Inc.
MITIGATION PLAN – SECTION 3
MILE 5.5 TO MILE 10 HOPE HIGHWAY
OVERHEAD LINE REBUILD (POLE 69A TO POLE 120)
hope-section3.dwg


158
162
163
155
400'
1200'
INSTALL UNDERGROUND
THROUGH AVALANCHE ZONE
DETAIL
MILE 15.1
MILE 14.85
MILE 14.6
MILE 13.3
MILE 13.1
MILE 12.55
MILE 12.32
MILE 11.98
MILE 11.5
MILE 11.35
MILE 11.2
MILE 10.7
MILE 10.45
MILE 10.15
TURNAGAIN ARM
HOPE HIGHWAY
HOPE
SEE DETAIL
INSERT POLE
STEEP BLUFF
INSERT POLE
DEADEND STRUCTURES AND
4/0 ACSR CONDUCTORS
AVALANCHE ZONE
INSERT POLE
INSERT POLE
PALMER CREEK ROAD
AIRPORT
195
174
149
148
142
139
134
123
120
-INSTALL UNDERGROUND LINES THROUGH AVALANCHE ZONES.
-INSTALL TALLER POLES AND 4/0 ACSR CONDUCTOR ACROSS AVALANCHE ZONE.
-CLEAN RIGHT OF WAY TO 40' WHERE PERMISSABLE.
-REMOVE DANGER TREES (SPRUCE BEETLE KILL).
-INSTALL INSERT POLES
-IMPROVE ACCESS ROADS AND GRADE WORK ALONG POWERLINE ROUTE.
-CHANGE OUT DEADEND INSULATORS
EXISTING OVERHEAD LINE
NEW OVERHEAD LINE
NEW UNDERGROUND LINE
CHUGACH
POWERING ALASKA'S FUTURE
Chugach Electric Association, Inc.
MITIGATION PLAN – SECTION 4
MILE 10 TO MILE 18 HOPE HIGHWAY
OVERHEAD LINE REBUILD & NEW UNDERGROUND
hope-section4.dwg

Appendix E: Cost Estimate

Section 1

Hope Substation to Hope Highway Milepost 1.7: Pole 1 to Pole 31 and Silvertip Tap

Clear right-of-way to a width of 40’	$	35,000.00
Remove danger trees outside the right-of-way	$	25,000.00
Install 9 insert poles and 3 double dead-end poles	$	90,000.00
Reconductor from pole 12 to Pole 12R12, approximately one mile	$	30,000.00
Improve access from Seward Highway Mile 55.5 to pole 6 and from the Hope Highway, mile 0.3 to pole 12R7	$	20,000.00
Complete and improve access along right-of-way from pole 6 to pole 12R4	$	15,000.00
Clear right-of-way for new overhead line adjacent to Hope Highway from mile 0.3 to mile 1.7	$	170,000.00
Install 24 poles and 1.4 miles of new conductor.	$	175,000.00
Remove existing power line from pole 12 to pole 31, approximately 2.1 miles.	$	40,000.00
Total for Section	$	600,000.00
Chugach Contribution: Engineering and Overhead*	$	198,000.00

Section 2

Hope Highway Milepost 1.7 to Mile 5.5: Pole 32 to Pole 68

Clear right-of-way for new overhead line adjacent to Hope Highway from pole 31 to pole 69	$	640,000.00
Install 60 poles and 4 miles of new conductor	$	560,000.00
Remove existing power line from pole 31 to pole 69, approximately 3.8 miles.	$	75,000.00
Total for Section	$	1,275,000.00
Chugach Contribution: Engineering and Overhead*	$	460,500.00

Section 3

Hope Highway Milepost 5.5 to Mile 10: Pole 69 to Pole 120

Install 7 insert poles and 4 double dead-end poles	$	140,000.00
Clear right-of-way to a width of 40’ and remove danger trees	$	460,000.00
Poles 85 to 100, right-of-way width is restricted due to private property. Remove spruce beetle damaged danger trees only	$	40,000.00
Improve access roads at Mile Post 5.6, 6.1, 6.45, 7.2, 8.25, 9.0, 9.8 and 10.15. Remove trees and re-grade access routes	$	75,000.00
Change out dead-end insulator strings on approximately 10 structures	$	10,000.00
Re-grade access paths in right-of-way to improve equipment mobility along line	$	65,000.00
Total for Section	$	790,000.00
Chugach Contribution: Engineering and Overhead*	$	279,000.00

Appendix E: Cost Estimate cont…

Section 4

Hope Highway Milepost 10 to Town of Hope: Pole 121 to Pole 208

Avalanche zones

Poles 139 – 142: Install taller poles and 4/0 ACSR for long span over avalanche valley	$	50,000.00
Poles 155 – 158 (1200'): Install line underground in avalanche zone	$	48,000.00
Poles 162 – 163 (400'): Install line underground in avalanche zone	$	24,000.00
Clear right-of-way to width of 40'	$	280,000.00
Remove danger trees	$	235,000.00
Pole 175 – 208: Right-of-way width is restricted due to private property. Remove danger trees only.	$	125,000.00
Install 4 new insert poles and 2 double dead-end poles	$	60,000.00
Poles 148 – 149: Install 4/0 ACSR and dead-end structures to span climbing bluff	$	28,000.00
Improve access roads at mileposts 10.33, 10.45, 10.74, 11.2, 11.5, 11.98, 12.32, 12.55, 13.1, 13.3, 14.6 14.85, and 15.1	$	130,000.00
Re-grade access path in right-of-way to improve equipment mobility along the line	$	40,000.00
Change out dead-end insulator strings on approximately 14 structures	$	14,000.00
Total for Section	$	1,034,000.00
Chugach Contribution: Engineering and Overhead*	$	350,000.00

*** Overhead rate is established on an annual basis: 30% was used for these estimates.**

Appendix F: Project Mitigation Schedule

Task/Subtask	Duration In Months
Section 1 **Hope Substation to Hope Highway Mile 1.7: Pole 1 to Pole 31 and Silvertip Tap**	
Right-of-Way and Permitting	6
Design	3
Construction	3
Section 2 **Hope Highway Mile 1.7 to Mile 5.5: Pole 32 to Pole 68**	
Right-of-Way and Permitting	3
Design	3
Construction	3
Section 3 **Hope Highway Mile 5.5 to Mile 10: Pole 69 to Pole 120**	
Right-of-Way and Permitting	3
Design	3
Construction	3
Section 4 **Hope Highway Mile 10 to Town of Hope: Pole 121 to Pole 208**	
Right-of-Way and Permitting	4
Design	3
Construction	3